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ABSTRACT

While the Personalized System of Instruction introduced by Keller individualizes the college classroom, it may be impractical when time is limited by administrative rules, without modification. Having students pace themselves within a fixed academic time period usually leads to procrastination and cramming at the end of the semester/quarter. The present system attempted to correct the problem of cramming by providing students enrolled in a course in physiological psychology with "self-charting forms" to permit precise feedback early in the semester. It was found that emphasizing the use of the forms increased their effectiveness and adding point contingencies increased the effect still more. Sections of the course (which combined modified Keller elements with a point-token system and a lecture-discussion classroom format) exposed to the contingencies did more early work in both qualitatively graded and ungraded categories, crammed less, and did better during chart-submission contingency intervals on instructor-paced, graded, objective exams. Student responses to course/instructor-evaluation forms were slightly superior as a result of the treatment. The system is simple to use. (Author)

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THE EFFECTS OF REINFORCING SELF-CHARTING OF COURSE PROGRESS ON COURSE WORK PRODUCTIVITY IN COLLEGE COURSES

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The "Personalized System of Instruction" (PSI) introduced by Keller (1968), in which teacher-pacing of student work is eliminated by allowing students to take tests until course content is mastered or the student withdraws from the course, has strongly influenced most applications of contingency management to the college classroom.

However, Miller, Weaver, and Semb (1974), reviewed the PSI literature and concluded that self-pacing produced a large amount of incomplete and postponed work. Because administrative policy in many institutions (including the author's) is to sharply limit incompletes, modification of Keller's PSI to reduce incompletes may be a necessity. Modifing the PSI concept to conform with limited time allowances introduces a new problem. Whaley and Malott (1971) commented on the tendency of students under student-paced conditions within fixed academic time periods to procrastinate or cram. Attempting to reduce cramming by returning to instructor-pacing sacrifices much of the individualization charactoristic of Keller's PSI and compels students to submit coursework on schedules which may be neither convenient nor compatible with the schedules of other professors.

The author of this paper has been experimenting since 1972 with combinations of a "Modified Keller" (Born, Gledhill, & Davis, 1972) format,

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a token economy type point system, and a lecture-discussion classroom. Throughout the courses, students were offered the options of taking optional instructor-paced quizzes, writing papers (due by target dates), or submitting ungraded, student-paced work (limited to 50% of total points credited towards the student's grade). Students were given "self-charting forms" to record their weekly cumulative point totals. Student productivity and faculty/course evaluation ratings were improved compared to matched conventional courses (Swenson, 1973). Unfortunately, students submitted great quantities of below average work near the end of the terms (cramming) eliciting an unwanted fixed interval (FI) scallop in instructor grading rates. Interviews with students revealed that few of the most extreme crammers had used the "self-charting forms".

The present study investigates the effectiveness of an emphasis on, and contingencies for , the use of "self-charting forms" in reducing cramming.

METHODS

Subjects: Loyola Marymount University students enrolled in the required course Introduction to Physiological Psychology during Fall Semester, 1974, served as experimental subjects. Two sections were offered (Section A, N= 31, and Section B, N= 36) Students from the Spring, 1974, section of the course (N= 28) were used as no-treatment control subjects. The same

lecture notes, point system contract, and objective quiz item file were used by the author for all groups.

The Point System:

Students received grades ranging from "A" to no credit dependent upon:

a) Exceeding the point quantity criterion for a given grade.

b) Earning a minimum of four grades at or beyond the desired grade from any combination of qualitatively graded quizzes (all optional) or papers (student paced with target dates and restrictions).

c) Earning a minimum of ten points during each of five equal length "learning modules" for the grades of "A" and "B".

To increase the number and quality of papers, students could earn points both by submitting written summaries of their background reading (graded acceptable or not acceptable) and for submitting the finished papers (qualitatively graded).

Points could also be earned by participation in quiz grading sessions, for fieldtrips to educationally relevant sites, and for contributions to the course (as bringing films, guest lecturers, and demonstrations into the classroom).

Materials:

The required "Guide to the Point System" * developed by the author was sold in the campus bookstore. This guide included a detailed explanation of the point system, the theme of each learning module, a day-by-day list of;

* Available upon request.

reading assignments, learning objectives, and lecture topics, and the "self-charting form". This form (see Figure One) included a table in

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Insert Figure One about here

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which the student was to record weekly point totals and weekly points earned by categories (quizzes, papers, reading summaries, fieldtrips, and class contributions). On the right side of the form, a graph was provided with dotted lines showing the rate of point accumulation required to meet the point quantity criterion for each grade. By plotting weekly cumulative point totals, the student could predict a final point total based on the continuation of a current rate of point accumulation and predict their final grade (if the quality criterion had been met).

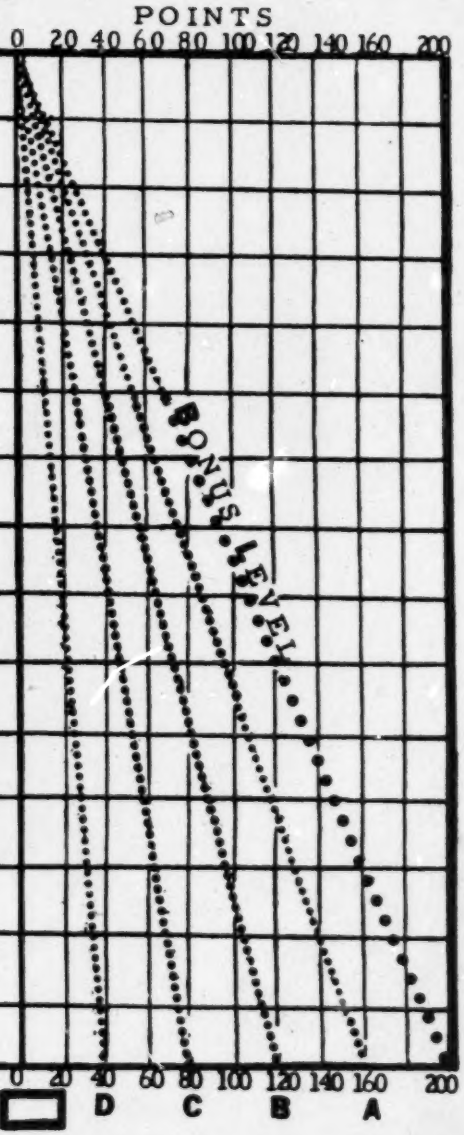
Procedure:

On the first day of each class, the instructor discussed the charactoristics of the point system with the students and Section A and B students were requested to use the table and the cumulative graph sections of the "self-charting forms". Nothing was said concerning collection of the forms or point consequences for filling them in correctly. No requests to use the forms were made to the Spring, 1974, class although student questions concerning the forms were answered throughout the semester.

At the end of the third week of classes the author selected, via a coin toss, Section B for the first on-contingency (OC) condition. Section B was informed that properly filled-in "self-charting forms" were due at the end

SELF-CHARTING FORM (By Weeks)

WEEK	QUIZZES	PAPERS	READING (CARDS)	FIELD-TRIPS	OTHER REPORTS	CONTRI-BUTIONS	WEEK SUMS
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							
13							
14							
FINAL							



NAME _____

COURSE _____ SECTION _____

FINAL POINTS ☐ GRADE ☐

QUALITY CRITERIA? ☐

Figure One: The Table used to record points earned by weeks and categories and the grade prediction cumulative graph.

of week six to allow the instructor to compare records. Forms submitted on time and correctly fill-in earned five points, late (maximum one week) and incorrectly filled-in forms resulted in no consequences, and missing forms cost five points. No instructions were given to Section A.

On Friday of week six, the "self-charting forms" were collected from Section B, compared with the instructor's records, notes added concerning discrepencies or failing performance, points for submission of the forms recorded, and the forms returned on Friday of week seven. Starting Friday of week six, the students enrolled in Section A received a similar treatment with their forms collected on Friday of week nine and returned on Friday of week ten.

This study combined a three group design with time series and reversal comparisons within the two most similar groups to control for both intact group type errors and time related errors.

Weekly point totals from the instructor's records were divided into quizzes, papers, and non-graded categories (omitting points from assisting in grading sessions).

To investigate the effects of the procedures on student attitudes, faculty course evaluation forms were filled in by all students in the absence of the instructor on Wednsday of week five for Sections A and B and the last day of classes for all sections.

RESULTS

Figure Two $_a$ is the cumulative graph of total points earned through ungraded work for all sections and Figure Two$_b$ is the equivalent graph

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Insert Figures Two$_a$ and Two$_b$ about here

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of points earned by submitting papers. As can be seen, in all cases the curves for the experimental sections ascend most rapidly at two points; the OC weeks and the final weeks of each course. The control section had a pattern of constant acceleration of student work in both categories.

Statistical analysis supports the visual evidence of strong schedule control of the chart submission contingency. For Section B during the their OC module, over twice as much total non-quiz work was produced per student as submitted by Section A students. ANOVAs (modules x sections with repeated measures over students and using the unweighted means procedure) over non-graded and paper earned points yielded significant simple effects for Section B as follows: Mean non-graded points earned during the modules before and after the OC module (B1 and B2) were significantly lower ($F = 12.45$, $df = 1, 87$) then the Section B OC non-graded which were significantly higher than Section A points during the same module ($F = 5.12$, $df = 1, 343$). Mean baseline ((B1 + B2)/2) points earned through papers approached being significantly lower ($F = 2.92$, $df = 1, 87$, $p < .1$) than paper earned OC points.

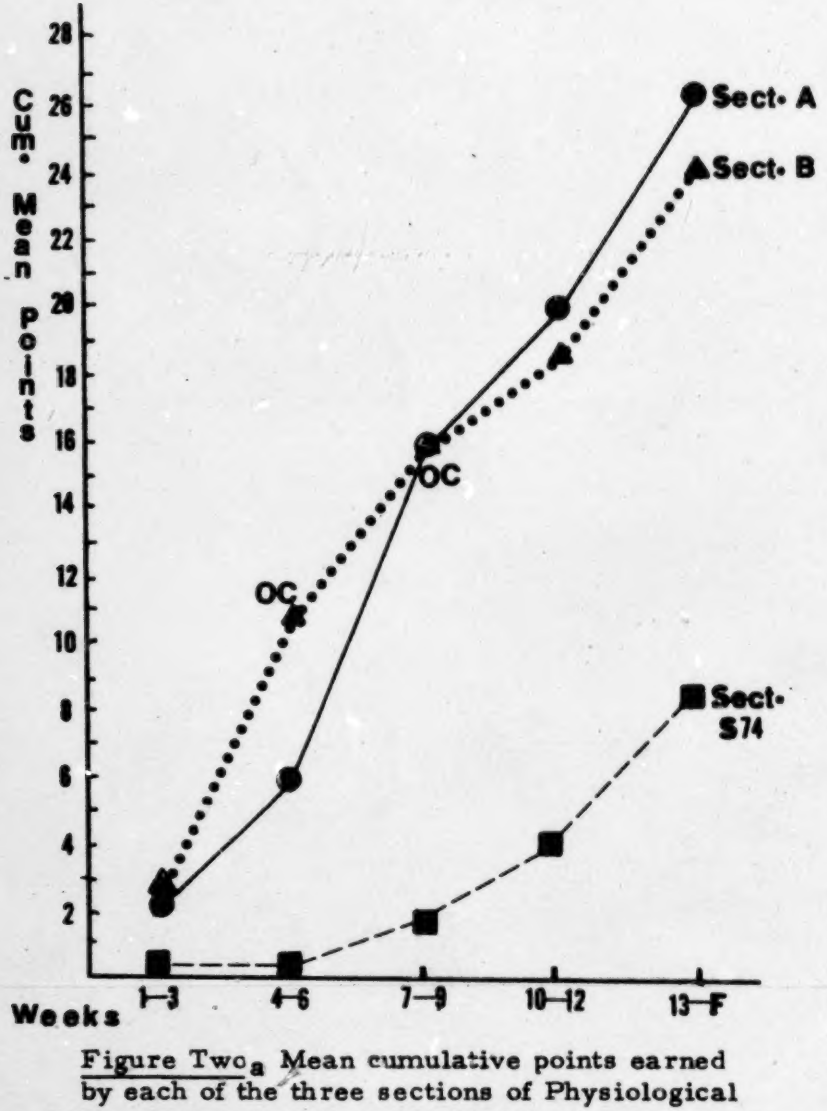

Figure Two$_a$ Mean cumulative points earned by each of the three sections of Physiological Psychology by "Learning Modules" from extra (ungraded, student-paced) work.

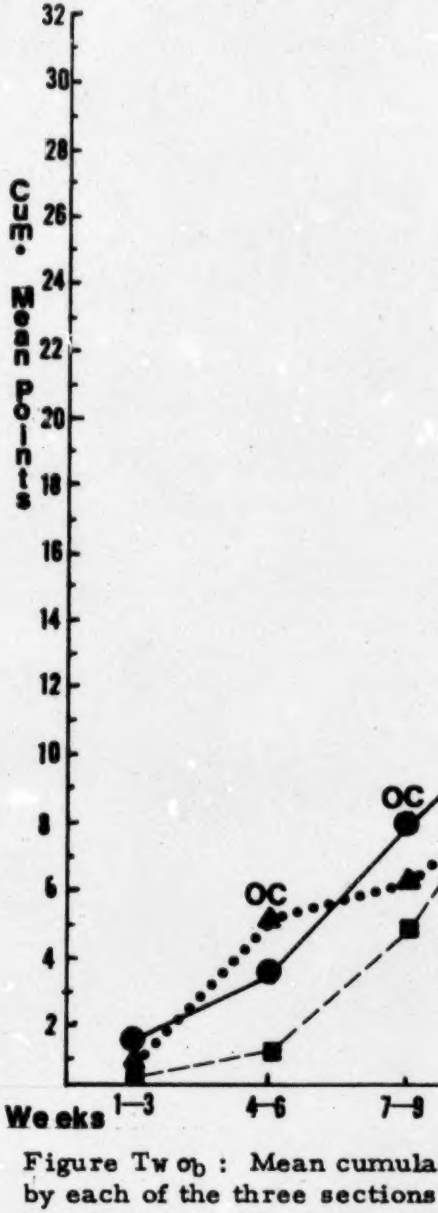

Figure Tw o_b : Mean cumula
by each of the three sections
Psychology by "Learning Mo
papers (graded and student-p

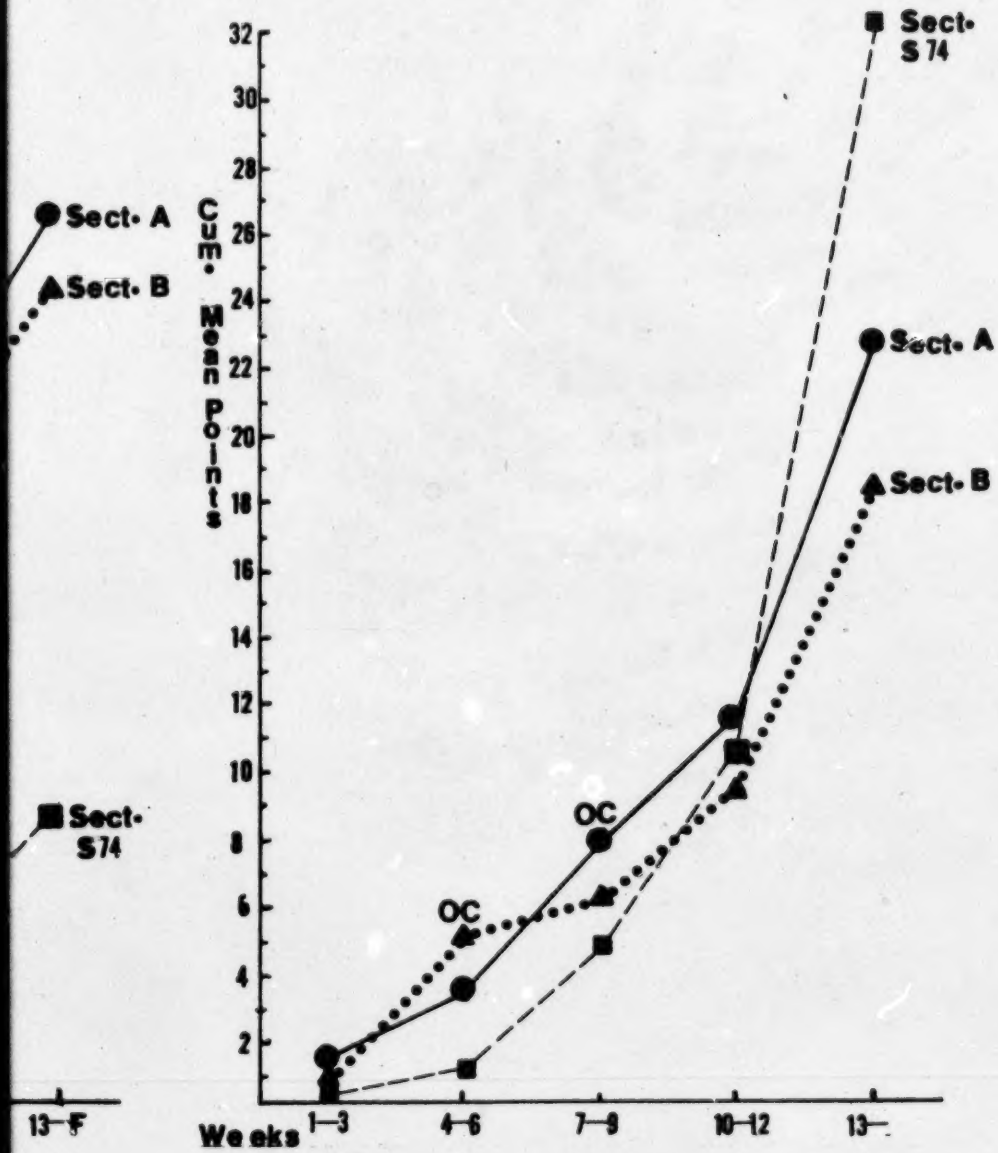

Figure Two b : Mean cumulative points earned by each of the three sections of Physiological Psychology by "Learning Modules" from papers (graded and student-paced with restrictions).

The pattern is similar for Section A . Looking at non-graded work earned points, Section A's OC module points were significantly higher than the points earned by Section B during the same time period (F= 16.6, df= 1, 87). In comparing Section A's mean baseline ((B1 + B2)/2) points with OC earned non-graded points, the OC points were significantly higher (F= 18.4, df= 1, 343). As with Section B, the effect on production of papers was less dramatic with Section A OC totals earned from papers being significantly higher than the paper earned points obtained by Section B students during the same time period (F = 5.79, df= 1, 87) but the within Section A effects being not significant.

An unexpected result for both sections was the apparent effect of the "chart submission" contingency on objective quiz performance which can be seen in Table One. Section B did significantly better on quiz 2 which coincided with Section B's OC module and Section A's B1 module. Section A

TABLE ONE: A Comparison of Averaged Test Performance for Each Quiz and for all Quizzes Combined for Each Class.

QUIZ	SPRING 1974	SECTION A	SECTION B	"t" TESTS (A vs. B)
1	14.2	13.2 (Baseline I)	14.9 (BaselineI)	N.S.
2	14.2	13.1 (Baseline I)	16.3 (Contingency)	t= 3.29, Sig. at .001
3	15.2	17.7 (Contingency)	16.5 (Baseline II)	t= 1.01, N.S.
4	14.8	13.0 (BaselineII)	14.9 (Baseline II)	t= 2.92, P less than .01 .
5	14.8	13.1	12.1	N.S.
Overall Means	14.7	14.0	14.9	N.S.

raised its quiz performance from significantly lower during B1 to slightly higher during OC and then did significantly poorer during B2.

While the evidence for powerful schedule control of student work by the experimental procedure is presented above, perhaps a stronger reason for adoption of such procedures is given by comparing total patterns of performance of all three sections. It can be seen in Figures Two$_a$ and Two$_b$ that the Spring, 1974, students do much less work in the ungraded work category and what they do, do, is done mainly at the end of the course. In the points earned through writing papers, the control section again starts much later (procrastinated) and then made powerful efforts to compensate for early neglect (crammed). In looking at Table TWO , it can be seen that this FI - one semester pattern of performance led to many more control subjects being categorized as crammers (defined as students earning more than 50% of their total points during the last three weeks of the course).

TABLE TWO : Grade Distributions, Percents of Students Submitting Papers and Non-Graded Work, and "Crammers" by Performance Level and Class.

CLASS	GRADES	PAPERS	NON-GRADED WORK	"CRAMMERS"
SPRING 1974	A/B 39%	100%	45%	91% N=10
	C 36%	50%	10%	40% N= 4
	D/NC 25%	29%	0%	29% N= 2
SECTION A	A/B 47%	64%	93%	23% N= 3
	C 47%	50%	64%	14% N= 2
	D/NC 6%	0%	0%	0%
SECTION B	A/B 64%	52%	96%	4% N= 1
	C 25%	44%	89%	22% N=2
	D/NC 11%	25%	25%	25% N= 1

Table Two also shows that the end result of the pattern of procrastination displayed by the Spring, 1974, section was fewer A or B grades and more failing grades. While the control subjects wrote more papers than the experimental sections, (see Table Three) many of these papers were last minute, poor quality efforts.

A final result of the present procedures. Standardized course/instructor yeilded slightly more favorable and slightly less negative (totaling less than 4% in all sections) responses, but no differences approached significance. Hence the "turn-in charts" contingencies were neither highly resented nor appropriately appreciated.

TABLE THREE: Relative Point Contributions of Three Categories of Student Work for each Course by Mean Percentages of Total Points Earned, By Number of Submitters, and Total Papers.

	SPRING 1974	SECTION A	SECTION B
QUIZZES	58%	57%	61%
Mean Quiz Attendance	61%	75%	76%
PAPERS	37%	18%	15%
Submitters	N=16	N=16	N=17
Total Papers	44	32	29
NON-GRADED WORK	7%	26%	24%
Submitters	N=8	N=22	N=31

DISCUSSION

As predicted, when use of the "self-charting forms" was emphasized, cramming behavior was reduced. Point consequences for submission of the forms augmented the effect of self-report as found by Bristal and Sloane (1974) for study time. Schedule control of non-instructor paced work was satisfactory for a procedure which has low instructor-time costs. The effect was greatest in increasing production of non-graded, optional work and in reducing cramming in this category. This suggests application to the "Modified Keller Format" (Born, et. al., 1972) where non-graded work was offered as an option but students made little use of this option.

The reduction of the FI scallop associated in many classes with the approaching end of a fixed quarter/semester was highly reinforcing to the instructor and allowed him to more evenly distribute his "grading of student work behavior" and increase personal attention to each item of student work. Student responses to course/instructor evaluation forms suggest that students do not resent the manipulation or balance it against the advantages to themselves of having feedback early in a course. The effects of the "chart submission" contingency on quiz performance suggests beneficial effects on qualitative as well as quantitative aspects of academic performance.

To summarize, a procedure combining the emphasizing of "self-charting forms" with point consequences reduced cramming, increased student-paced work, improved quiz performance, and is applicable to a wide range of objectively graded academic environments at low response cost.

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